Car Tally

Estimated Time: 1-2 hrs

Objectives:

- Design and conduct a traffic survey to explore traffic volume on key local roads.
- Collect and analyze observational data.
- Understand the connection between traffic volume, modes of transportation, air pollution and health.

Grade Level: K - 5

CA State Standard Connections:

See the BLUE text throughout the lesson plan that outlines the State Standard section the lesson or activity applies to.

Tool Kit Materials:

- Handout 1 (one per group)
- Handout 2 (one per group)

Additional Materials:

- Pencils and erasers
- Clipboards
- Timer or watch
- Student worksheet (included)

Increased traffic is an ongoing problem in many local communities, for several reasons. An increase in traffic often increases accidents, safety problems, traffic jams, and the time it takes to get places. Increased traffic is also a health and environmental concern: more vehicles on the road means more air pollution, since gasoline-powered vehicles release, or emit several air pollutants (called vehicle emissions). Increased air pollution can cause people to have breathing problems and aggravate heart and lung disease. Also, driving more, instead of walking or bicycling, means we get less exercise, which can potentially contribute to health problems such as obesity, heart disease, and diabetes. Traffic is an environmental and economic concern for another reason as well: more cars on the road means more gasoline is used to run those cars. Gasoline is made from oil, of which there is a limited amount in the world.

This activity is a mini-field trip that provides students with hands-on experience in conducting a traffic survey in their own community, analyzing their data, and exploring the connection between traffic and air pollution. If time permits, students can create presentations of their data.

Key Questions

- Do you think there is too much traffic along the main (2-lane) roads in your community? If so, how many vehicles do you think travel along these roads during morning rush-hour traffic? How many people do you think are typically in each vehicle?
- How might the amount of traffic be reduced?
- How might the amount of air pollution from traffic be reduced?
- What might some of the benefits be of reducing traffic and air pollution from vehicles?
- What things might affect the accuracy of a traffic survey's results?
- What vehicles produce the most pollution per person?

Vocabulary

Tally: Counting using marks rather than names or numbers

Emissions: Substances discharged into the air. Releases of pollutants from a variety of sources and activities, including vehicles, factories, power plants that make electricity, and wood-burning stoves and fireplaces, amount others.

Procedure

SETTING THE STAGE

- Make important arrangements, such as obtaining parental permission slips to go to off-school premises, and getting commitments from adult classroom assistants and/or parent volunteers to accompany the class groups. (Note: if going offsite is problematic, you can instead conduct the traffic survey on school premises near the driveway of the school)
- Choose the roads on which the class will survey traffic volume and vehicle types. Choose a minimum of two roads, for comparison purposes. Choose roads that are within easy walking distance of the school, and are busy two-lane (one travel lane each direction) roadways. Select a time of day when the roads have moderately busy traffic, such as morning rush hour.
- Give students an overview of the traffic survey. Inform students that the class will conduct a traffic survey to explore traffic volume on key local roads, and the connection between vehicles traffic and air pollution. Discuss the "key questions" above with the class if you have not already done so. Tell the class that they will divide up into groups of at least 8 students per group and will stand safely by the sides of different busy roads. For a 15 minute period some students will count the number of vehicles driving by, while others students will identify the type of each vehicle (e.g., car, truck, etc.), or the number of people in each vehicle.
- Explain a tally chart. Tell students that to conduct the survey, they will make tally charts that keep track of the number and types of vehicles and the number of people in each vehicle, and that the class is first going to practice making these charts. On the chalkboard, illustrate tally marks.
- Practice a traffic tally in class. Tell students to use the back of their Student Worksheets to practice recording the number and types of vehicles that you will be calling out to them. For simplicity, tell students to consider SUVs and vans as "trucks" and to ignore motorcycles. Then call out the names of the vehicle types listed below; do it quickly to simulate rapid traffic flow so that students can practice performing quick tallies, which they will need to do by the roadside.

car	car	car	truck	bicycle
truck	car	truck	car	truck
car	car	truck	bus	truck
bicycle	car	car	car	car
car	car	bicycle	truck	car
car	car	bicycle	truck	car
truck	car	car	car	truck
car	car	bicycle	truck	truck
car	car	car	car	truck
truck	bus	bus	car	car
car	truck	car	bicycle	truck
car	car	car	car	truck
bus	car	truck	bicycle	car
car	car	car	car	car

- Tell students to swap tally sheets and check for correct answers for each type of vehicle as you read aloud the totals: Bicycle = 7, Car = 41, Truck = 18, Bus = 4

- Explain to students that they will conduct the traffic survey in four parts. The first and second pairs will focus on the number and types of vehicles; the third and fourth pairs will focus on the number of people in each type of vehicle.

CONDUCTING THE TALLY

1. **1st Pair:** One person will call out loud to their partner the type of vehicle (e.g., "car", "truck") each time a vehicle passes in one direction (one side of street), while the other partner will record the data on Student Worksheet #1.
2. **2nd Pair:** One person will count vehicles passing in the other direction (on the other side of street), while the other partner records the data. **KCC.1, KCC.3**
3. **3rd Pair:** One person will call out the number of people in each vehicle in one direction and identify the type of vehicle, while the other partner will record the number of persons per vehicle and the vehicle type. Tell students that it may be difficult to identify the number of people, and to do the best they can. For buses, have the students discuss and agree on an estimate of the number of people they will use and make sure students are using the same number. **KCC.1, KCC.3**
4. **4th Pair:** One person will call out the number of people in each vehicle in the other direction and the vehicle type, while the other partner will record the number of persons per vehicle and the type of vehicle.

PROCEDURE

1. Explain ways that conducting the survey can help make it more accurate. That is, it is important for each group and each pair of students to do things exactly the same way. For example, each group must start the survey at the same time, and each group must conduct the survey for exactly 15 minutes- not longer and not shorter.
2. Assign the students to survey groups, and assign and adult assistant to each group. Have students in each group divide up into pairs; help them decide who will be an "announcer" (calling out the type of vehicle that passes or the number of people in each vehicle) and the one who will be the "recorder" in each pair. Assign one person (the adult assistant) to be the timekeeper, who will tell students when to begin and end the survey and record the exact starting and ending times.
3. Conduct the traffic survey at the designated locations, using Student Worksheet #1. If possible, have students stand in locations where they do not have to cross any streets. Be sure to remind students to practice safety; stand back from the roadway; if crossing a street is necessary, do so carefully when the adult assistant says it's safe to do so. Make sure students are standing in such a way that allows other pedestrians to pass easily, and that they are polite to people. **KCC.1, KCC.3, KCC.5, 1.0A**

ASSESSMENT

1. After the survey has been conducted, in class (on the same day or another day), have the student groups compile their survey results and discuss and analyze the results as a class.
   - **Calculate Totals:** Back in the classroom, in the top half of Student Worksheet #2, have each group add up the totals for their group, including the total number of each type of vehicle and the grand total number of vehicles. Ask a spokesperson from each group to read aloud the totals for their group, write these on the chalkboard, and add up the totals for the entire class. **KCC.5, 1OA.1, 1.OA.6**
   - **Calculate data for different vehicle types.** Of the total traffic, have the class calculate the portion of each vehicle type (e.g., cars, trucks, buses, bicycles). For younger students, this might be calculated as fractions. For older students, this might be calculated as fractions and percentages.
   - **Discuss results thus far.** Which roadway had the most traffic? Why does the class think this is so? Compare and contrast the numbers of different types of vehicles for each group
2. Explain the Air Pollution Values table on Student Worksheet #2 to the class. Tell students that you have assigned an "air pollution value" number to each type of vehicle. The number is an estimate of the degree of air pollution each type of vehicle releases for every person it carries, compared to the other vehicle types—the higher the number, the more air pollution. On Student Worksheet #2, in the Air Pollution Values table, tell students to look at the numbers in the "Air Pollution Value Per Person" column.

   Explain the rationale behind these numbers: Trucks with one or two people in them release the most pollution per person, so they are assigned the highest pollution value of "10." Cars with one or two people in them release the next most pollution per person, so they are assigned the next highest pollution value of "9." Cars and trucks with three or more people can be considered carpools (sharing rides) for this exercise; because more people are in the vehicle, it releases less air pollution per person, and is assigned a lower value of "3"—about one-third the pollution values of 9 or 10. (This is because a vehicle with three people in it would release about one-third of the pollution compared to three separate vehicles each carrying one person in it). Because buses can carry many more people than cars and trucks, the pollution value per person for buses is much lower ("0.2") than for cars and trucks. Bicycles don't release any air pollution, so their air pollution value is "0".
3. Tell students to fill in the "Total Number of People" column in the Air Pollution Values table in Student Worksheet #2. Ask students if they know where to get this information. If no one offers the correct answer, tell students they recorded this information on the bottom of Student Worksheet #1 during the traffic survey, in the "Number of People in Each Vehicle" box. Assist students as needed in adding up the data in Student Worksheet #1 and transferring it to the Total Number of People column of the Air Pollution Values table in Student Worksheet #2 (e.g., placing the numbers in the correct "Vehicle Type" rows in the table).

4. Next, demonstrate on the board how to calculate numbers for the "Estimated Air Pollution Value" column in the Air Pollution Value table. For one of the vehicle types listed, ask a student to give you his or her answer for the "Total Number of People" for that vehicle type. Multiply the total number of people for that type of vehicle by the "Pollution Value Per Person" number assigned to that vehicle type. Have students enter this answer in the "Estimated Air Pollution Value" column of the table. Have students work in groups to calculate the Estimated Air Pollution Value for the other vehicle type categories and record these numbers in the Air Pollution Values column in the table.

5. Discuss the results of the Air Pollution Values table. Which vehicle type had the highest air pollution value? Which vehicle type had the lowest air pollution value? Discuss the results for the other categories, and compare the numbers for all five vehicle types. If no buses were identified in the traffic survey, provide a hypothetical scenario for comparison purposes (e.g., two buses, each with 15 people in them, would result in an Estimated
6. Air Pollution Value of 6: Total Number of People [30] x Air Pollution Value Per Person [0.2] = Estimated Air Pollution Value [6]).
7. Discuss the relationship between traffic volume, air pollution, and health.

   Ask: If the number of vehicles on the road were reduced, might this reduce air pollution? (Correct answer: Yes). Why? (Correct answer: Because gas-powered vehicles release air pollutants, and fewer vehicles would mean less pollution.)

   Ask: How might the number of vehicles on the road be reduced? (Correct answers: Carpooling and using public transportation [buses, trains, subways] would reduce the number of vehicles on the road, which would reduce air pollution. Walking and bicycling would also reduce air pollution. You can also mention that new laws requiring vehicles to release fewer emissions would also help vehicles reduce the amount of air pollution.

   Ask: What are some benefits from reducing air pollution? (Correct answer: Less breathing problems and fewer asthma attacks and heart problems. People might also be healthier because they might get more exercise by walking or bicycling instead of driving. Also, trees and plants would be healthier if there was less air pollution.

8. Discuss the accuracy of the traffic survey methodology and results. Identify any potential problems regarding the data collection methods: Did one group collect data for 20 minutes instead of 15? Did some people miss counting some vehicles (e.g., because they weren't paying attention, because they sneezed, etc.)? Did some people "double-count" one or more vehicles? Could students really see the number of passengers inside vehicles? Did some people put certain types of vehicles in the wrong categories (e.g., did they remember to count SUVs and vans as trucks)? Did one group start earlier or later than another group? Did the weather suddenly change during the tally? Inform the class that any of these or other factors can affect the accuracy of the survey results. Ask the class if they have any ideas about how the survey could have been done more accurately. (Then tell students they did a great job, given the many things that can affect the accuracy of survey results.)
9. If time permits, have students create a presentation of the traffic survey and air pollution results. Depending on time available, either assign how the class should present the data, or, if more time is available, have the class discuss different ways of presenting the data and determine the best way to present the information (e.g., line graph, pie chart, pictogram, and/or bar graph). If time permits, you may want to have different groups present their data results in different ways.

   Building on prior classroom experience with different graphic presentation formats, explain to the class how to develop the type of presentation format you choose. Decide what units, scales, colors, symbols, spacing, etc. to use, as appropriate. If computers are available, consider having students use the Internet or relevant software to create charts or graphs.

   Discuss which type(s) of chart or graph conveys the information most effectively and why.

EXTENSIONS

1. Students develop a campaign to reduce car traffic at the school, which can include making posters to place around the school, writing letters to staff and to parents, and organizing carpools.

Design a Car-Free Weekend

Lead students in designing a car-free weekend for their families. Discuss with students which weekend activities require use of a car, which activities are best without cars, and which activities can be done using other modes of transportation. Students will identify how to spend the weekend without traveling by automobile and how to travel from their homes to destinations using only public transit, walking, or biking. Students can share their experiences with their classmates.

SLO Car Free: Car Free travel is making headlines across the nation. Now visitors to San Luis Obispo can enjoy the newest travel trend that helps keep the air clean. SLO Car Free is a cooperative partnership initiated and led by the APCD, with the goal of encouraging tourism to our region in a car-free, care-free way. SLO Car Free provides tools to travelers on the pleasures and availability of traveling to our area without their cars, or by parking their cars once they arrive. By pledging to travel to or around San Luis Obispo without a car, visitors receive special discounts from participating hotels, restaurants, transportation services and attractions. Visit www.slocarfree.org to see top attractions and sample itineraries to make your San Luis Obispo vacation car free and care free! Also follow SLO Car Free on Facebook (http://www.facebook.com/home.php?#!/pages/San-Luis-Obispo-CA/San-Luis-Obispo-Car-Free/144746813308?ref=ss) and Twitter (Search SLO Car Free)

iRideshare.org and the Transportation Choices Program (TCP): iRideshare is a service of SLO Regional Rideshare and will help you find a carpool, vanpool, bike or transit partners anywhere in San Luis Obispo County. Find matches for your daily commute, one time trips to special events or join a school pool. The program also provides Emergency Rides Home so you are never left without a ride, a commute cost calculator and calorie counter! iRideshare will help you get around without driving alone; saving you money and keeping our air clean. SLO Regional Rideshare and a Steering Committee also provide the Transportation Choices Program. Employees all over the county are looking for ways to save on transportation expenses and want to work for green businesses. The TCP is a free program in SLO County offered to businesses and organization that encourage their employees to use alternative transportation. The goal of the TCP is to equip employers with the tools needed to promote positive change in employee commuting habits.

NATIONAL SCIENCE EDUCATION STANDARDS

Science as Inquiry: Abilities Necessary to do Scientific Inquiry

Science in Personal and Social Perspectives: Personal Health, Changes in Environments

Car Tally- Student Worksheet #1

NAMES:_____ DATE:_____

1. Location (name of road, and main intersection)

_____

Number of Each Vehicle Type
KCC1, KCC.3, KCC.5, 1.0A

Type	Tally	Totals
CARS		
TRUCKS		
BUSES		
BICYCLES		

Number of Each Vehicle Type (Keep separate results for each individual vehicle)

Cars	Trucks	Bicycles	Buses (estimate)

Car Tally- Student Worksheet #2

Survey Results and Air Pollution Values

1. Location (name of road, and main intersection)

_____

2. Using your results in Student Worksheet #1, fill out the following information in the classroom after conducting the survey: **KCC.4, KCC.5, 1OA.1, 1OA.2, 2OA.2, 2OA.3, 2OA.4, 3NF.1, 3NF.2, 3NF.3.**

   Total number of cars: _____

   Total number of trucks: _____

   Total number of buses: _____

   Total number of bicycles: _____

   Total number of all types of vehicles: _____

3. After your teacher discusses the Air Pollution Values table below with the class, complete the table. **KCC.4, KCC.5, 1OA.1, 1OA.2, 2OA.2, 2OA.3, 2OA.4, 3NF.1, 3NF.2, 3NF.3**

Air Pollution Values

Vehicle Type	Total # of People	Air Pollution Value Per Person	Estimate Air Pollution Value
Trucks with 1 or 2 people		10	
Cars with 1 or 2 people		9	
Cars and Trucks with 3 or more people (carpool)		3	
Bus		0.2	
Bicycle		0	

If your teacher instructs you to do so, present your survey results (as a line graph, pie chart, bar graph, and/or pictogram, as your teacher tells you).

NAMES:_____ DATE:_____

Car Tally- Additional Worksheet

As a group, answer the following questions:

1. How can carpooling reduce air pollution?

_____

_____

2. What can students do to help reduce car travel and air pollution?

_____

_____

_____

3. Did you see cars idling? If so, why could this be bad for air pollution?

_____

_____

_____

4. What can teachers and school staff do to help reduce car travel and air pollution?

_____

_____

_____

5. On the back side, draw a design for a logo or symbol to remind the school or the community to drive less. For example, the logo could be a symbol for walking more and driving less.